FSM design

You need to be alert to (usually minor) changes that may be made to the assignment statement or to the guidelines after the assignment is first put up. Refresh this frame and re-read the assignment carefully before you make your final submission.

Assignments

1. Design a Finite State Machine (FSM) that will take an arbitrary-sized integer as input, one bit at a time (starting from most significant bit), and return the remainder after this integer is divided by 3.

2. A controller for an elevator is to be designed. The elevator can be at one of two floors: Ground or First. There is a pair of radio buttons in the elevator cabin: Up or Down. Also, there are two lights in the elevator that indicate the current floor: Red for Ground, and Green for First.

   At each time step, the controller checks the current floor and current input, changes floors and lights in the obvious way.

   Draw the FSM diagram, develop a represention of the states and the alphabet symbols. Form the truth tables for the NS and output functions. Give a complete realisation of the FSM.

3. Build an electronic combination lock with a reset button, two number buttons (0 and 1), and an unlock output. The combination should be 01011.

4. Design the FSM controller for a vending machine. All selections are for Rs 30. The machine makes change (five and ten rupees only.)
   Inputs: limit 1 per clock (when output is not active)
   - F: Five rupees coin inserted
   - X: Ten rupees coin inserted
   - T: Twenty rupees coin inserted
   Outputs: limit 1 per clock
   - DC: dispense can
   - DF: dispense five rupees coin
   - DX: dispense ten rupees coin

5. A controller for an elevator is to be designed. The elevator can be at one of two floors: Ground or First. There is a pair of radio buttons in the elevator cabin: Up or Down. There is also a button at each floor to call the elevator there. Also, there are three lights in the elevator that indicate the current floor: Red for Ground, Green for First and Blue for Second.

   At each time step, the controller checks the current floor and current inputs, changes floors and lights in the appropriate way so that the all requests in one direction (ascending or descending) are served before the direction is changed.

   Draw the FSM diagram, develop a represention of the states and the alphabet symbols. Form the truth tables for the NS and output functions. Give a complete realisation of the FSM.

6. A traffic light controller for horizontal and vertial traffic is to be designed. If only horizontal or vertical traffic is present that should be passed. If there's no traffic, the current pass signal is to be maintained. If both traffic are present, the one that was not favoured last time should be

favoured this time -- favouring is applicable only when both are present together.
Inputs:
- H: presence of horizontal traffic
- V: presence of vertical traffic

Outputs:
- PH: pass horizontal traffic blocking vertical traffic
- PV: pass vertical traffic blocking horizontal traffic

7. A traffic light controller for horizontal and vertial traffic is to be designed with provision of timeout. Timeout is activated after a pass signal is given. If there's no traffic after a timeout, then timeout is not active. The pass signal does't change when timeout is active. If only horizontal or vertical traffic is present when timeout is inactive, that should be passed and timeout activated. If there's no traffic, the current pass signal is to be maintained. If both traffic are present when timeout is inactive, the one that was not favoured last time should be favoured this time and timeout should be activated -- favouring is applicable only when both are present together when there timeout is inactive.
Inputs:
- H: presence of horizontal traffic
- V: presence of vertical traffic
- T: timeout

Outputs:
- PH: pass horizontal traffic blocking vertical traffic
- PV: pass vertical traffic blocking horizontal traffic
- ST: activate timer

8. Manchester code is a coding scheme used to represent a bit in a data stream. A *0* is encoded as a *0-1* transition while a *1* is encoded as a *1-0* transition. The advantage of Manchester encoding is that every bit has an signal transition and so the transmitted bit stream has the clock embedded in it which may be recovered to determine the bit boundaries. Inputs:
- D: the data line
- V: data on the data line is valid

If the the data is not valid the output is zero, otherwise, the output is the Manchester encoding of the input. Design the FSM to carryout Manchester encoding.

Assignment submission

A PDF report, as appropriate, should be submitted. Submit all your files together.

Use electronic submission via the [WBCM link](#)

You should keep submitting your incomplete assignment from time to time after making some progress, as you can submit any number of times before the deadline expires. **You should submit all your files together**.

Warning

Cases of copying will be dealt with seriously and severely, with recommendation to the Dean to de-register the student from the course.